US011124373B2

(12) **United States Patent**
Moya Rojo et al.

(10) **Patent No.: US 11,124,373 B2**
(45) **Date of Patent: Sep. 21, 2021**

(54) **SHEET MEDIA PROCESSING MACHINES WITH RE-FEED PREVENTION ELEMENTS**

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(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 329 days.

(21) Appl. No.: **15/760,557**

(22) PCT Filed: **Jan. 21, 2016**

(86) PCT No.: **PCT/EP2016/051265**
§ 371 (c)(1),
(2) Date: **Mar. 15, 2018**

(87) PCT Pub. No.: **WO2017/125160**
PCT Pub. Date: **Jul. 27, 2017**

(65) **Prior Publication Data**

US 2020/0239246 A1 Jul. 30, 2020

(51) **Int. Cl.**
B65H 1/04 (2006.01)
B65H 1/26 (2006.01)
(Continued)

(52) **U.S. Cl.**
CPC ***B65H 1/04*** (2013.01); ***B65H 29/52*** (2013.01); *B65H 1/266* (2013.01); *B65H 5/38* (2013.01);
(Continued)

(58) **Field of Classification Search**
CPC B65H 1/04; B65H 1/266; B65H 2405/332; B65H 2405/3321; B65H 2405/3322;
(Continued)

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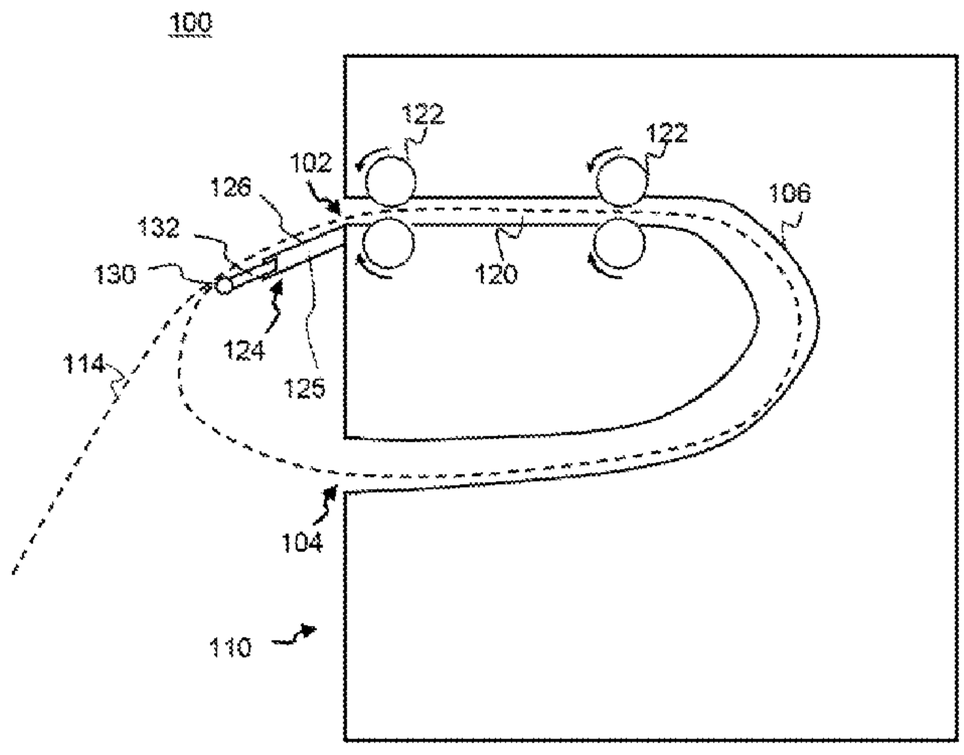
(57) **ABSTRACT**

There is disclosed a sheet media processing machine comprising a media inlet to receive sheet media along a feed direction from a first side of the machine and a media outlet to discharge sheet media along a discharge direction towards the first side of the machine. There is a feed mechanism to convey sheet media from the media inlet to the media outlet,
(Continued)



and a re-feed prevention element disposed upstream of the media inlet with respect to the feed direction to inhibit recirculation of discharged sheet media along an external recirculation path between the media outlet and the media inlet. The re-feed prevention element is exposed to contact with sheet media and comprises an elastomer. There is also disclosed a feed guide comprising a re-feed prevention element, and a method in which such a feed guide is installed on a sheet media processing machine.

12 Claims, 4 Drawing Sheets

(51) **Int. Cl.**
B65H 29/52 (2006.01)
B65H 5/38 (2006.01)

(52) **U.S. Cl.**
CPC *B65H 2407/21* (2013.01); *B65H 2801/06* (2013.01); *B65H 2801/12* (2013.01); *B65H 2801/39* (2013.01)

(58) **Field of Classification Search**
CPC B65H 29/52; B65H 2801/39; B65H 2801/12; B65H 2801/06; B65H 2407/21; B65H 5/38; B65H 2405/112; B65H 2405/1122; B65H 2405/1118; B65H 2404/693
See application file for complete search history.

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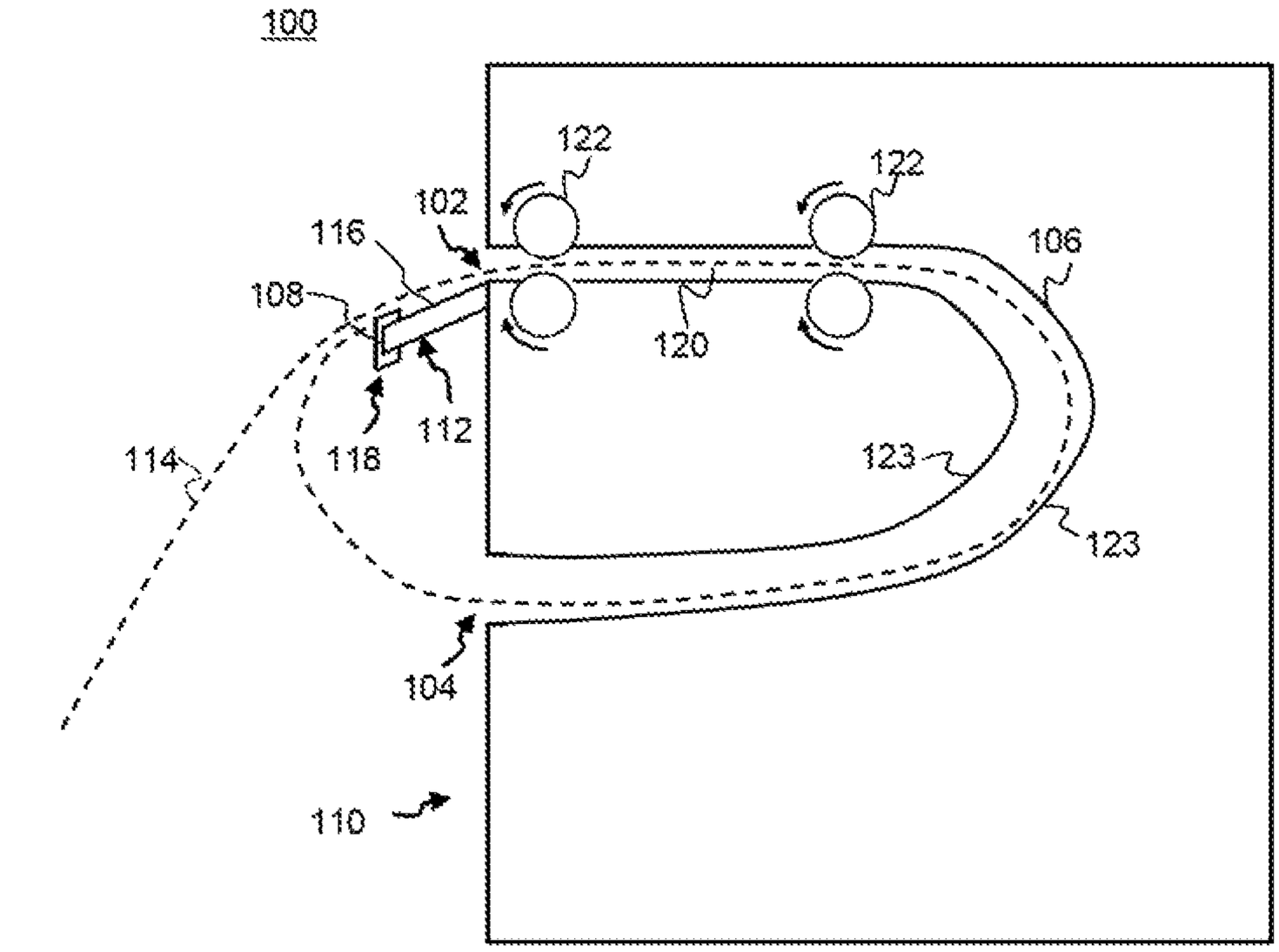

Figure 1

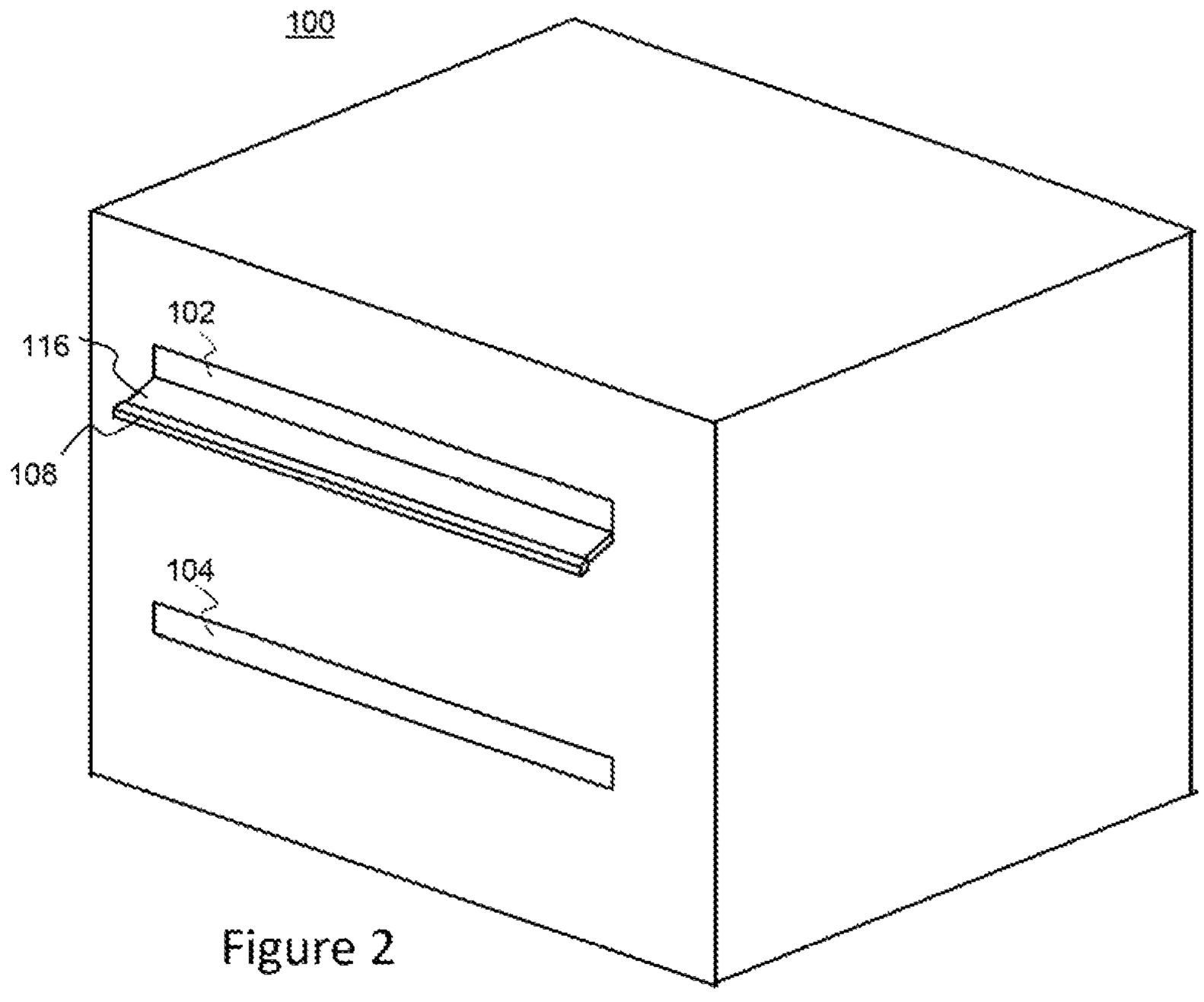

Figure 2

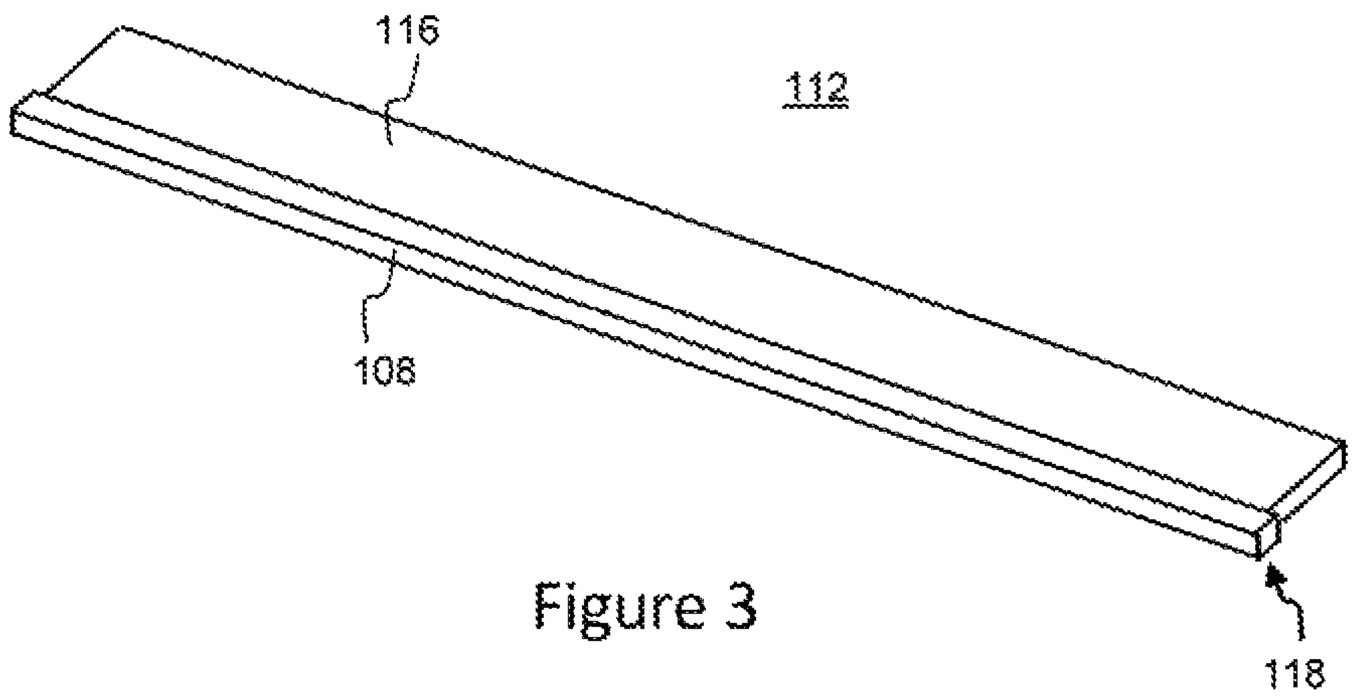

Figure 3

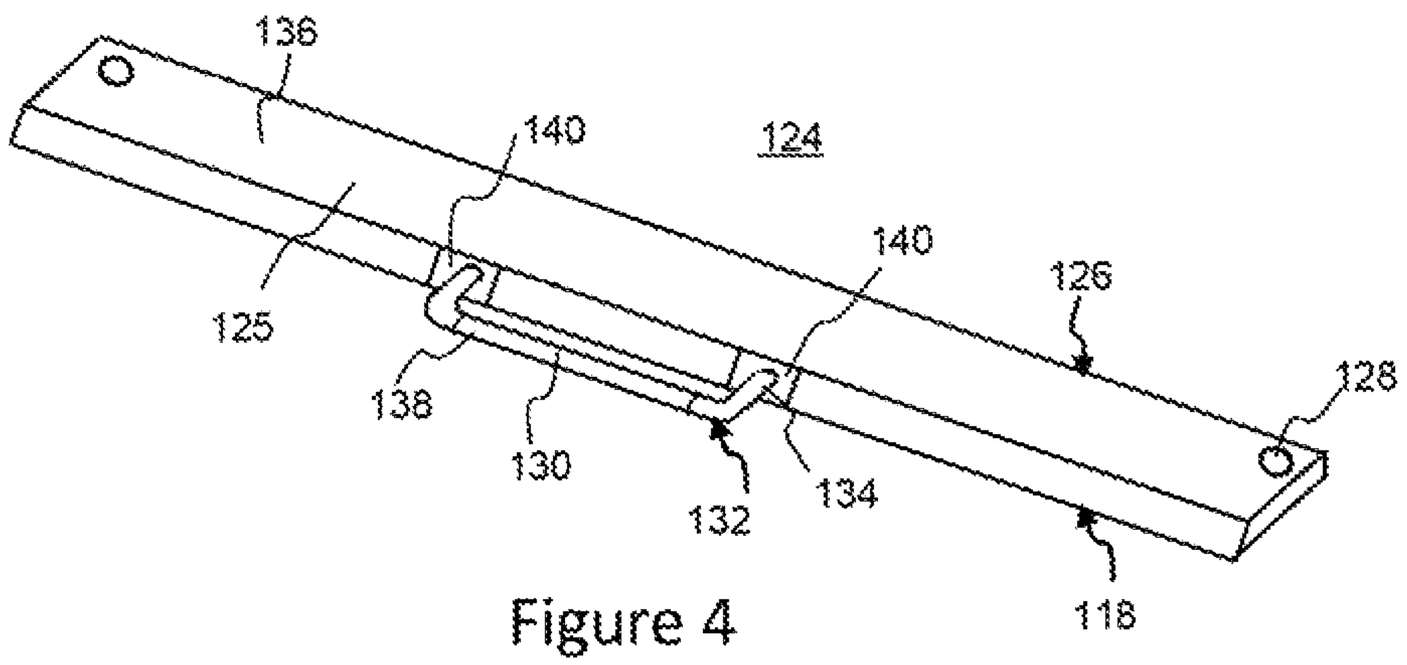

Figure 4

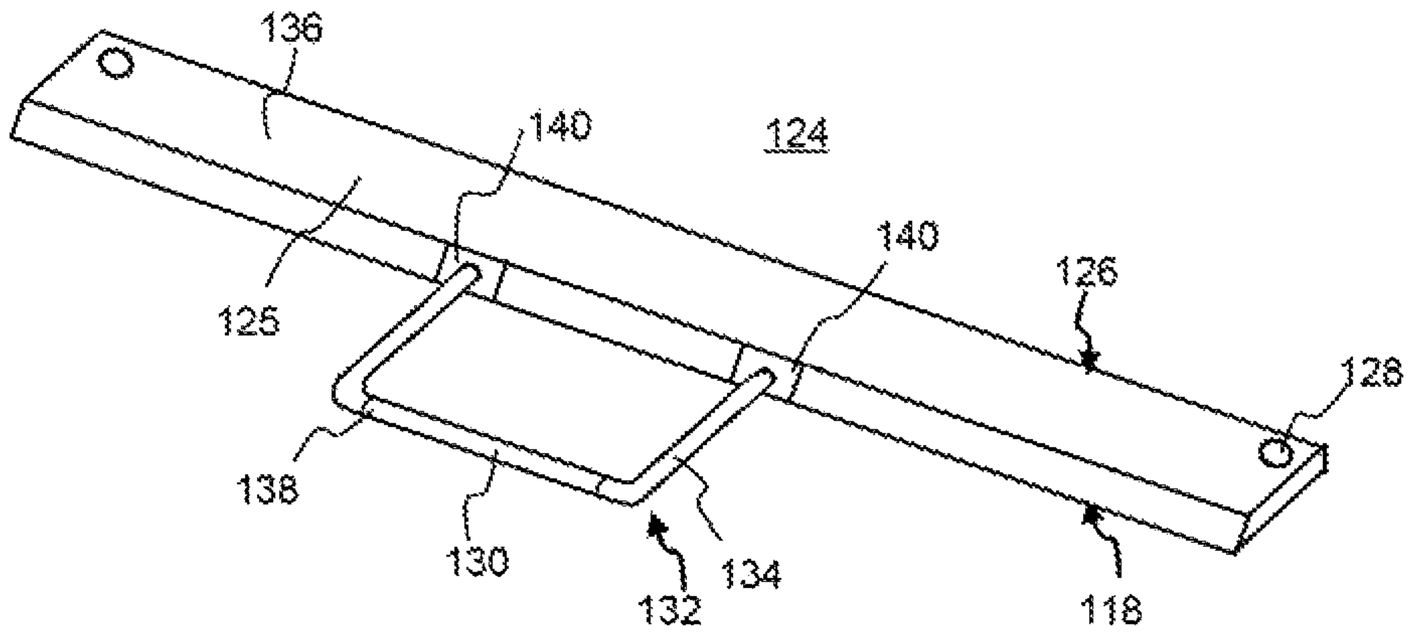

Figure 5

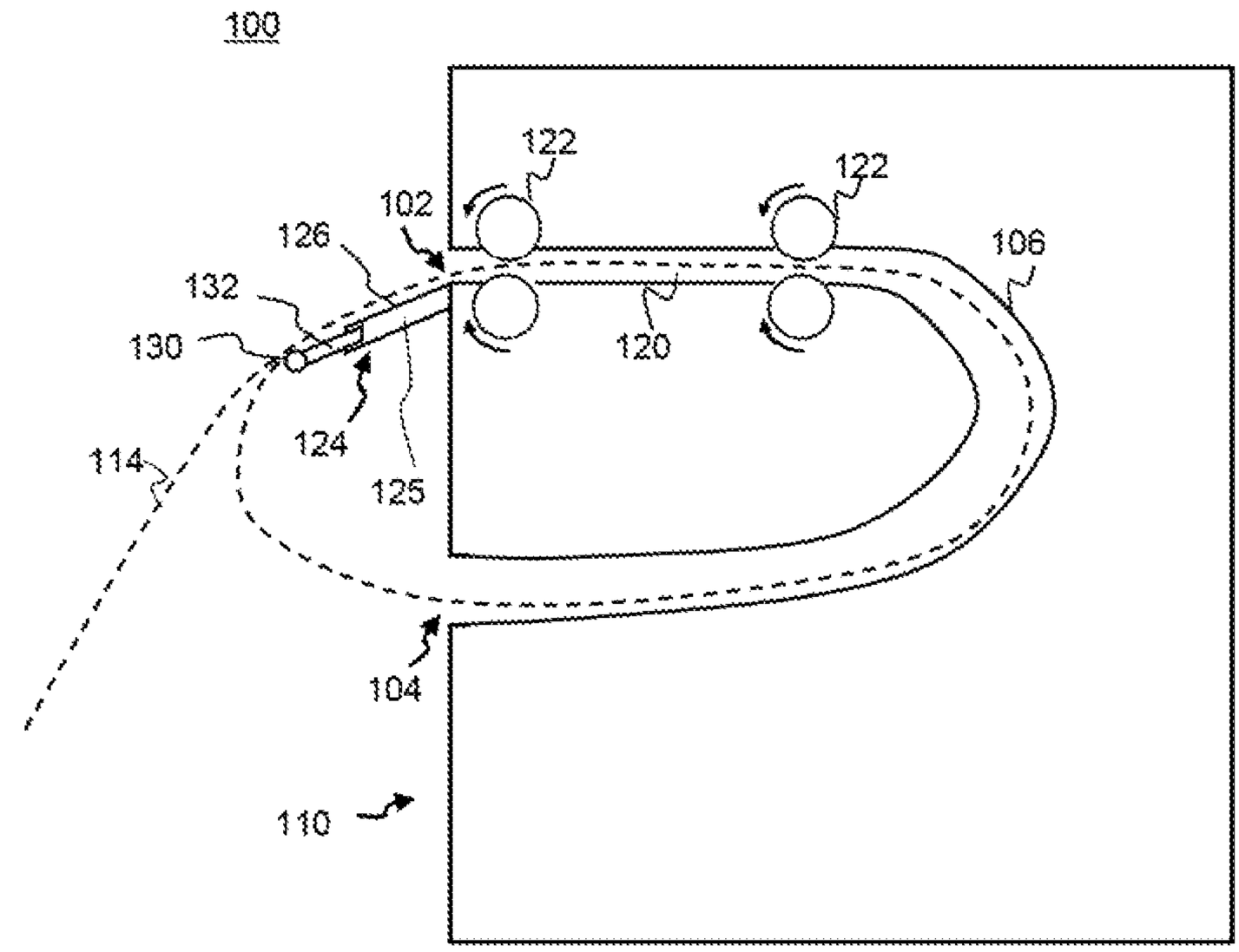

Figure 6

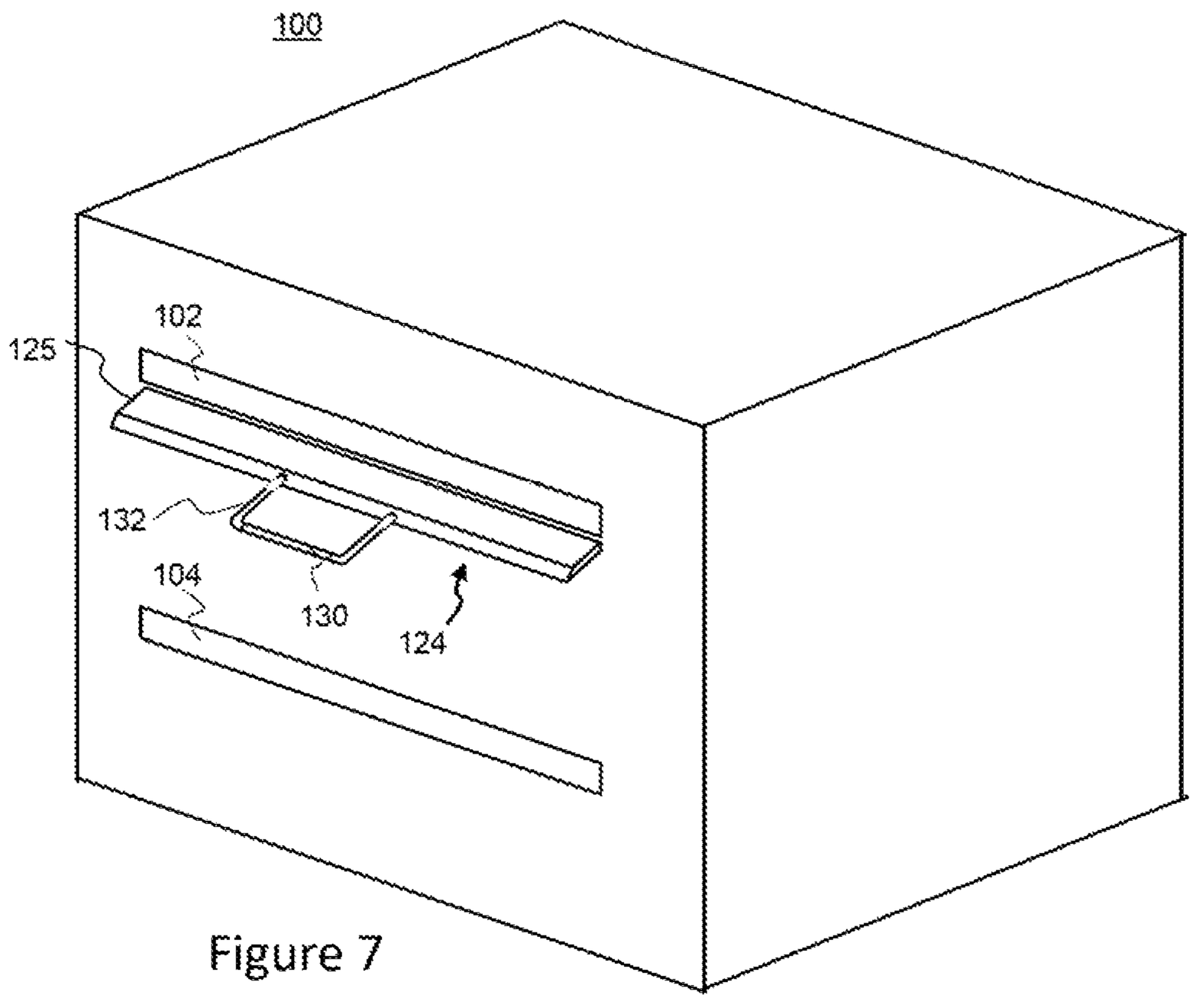

Figure 7

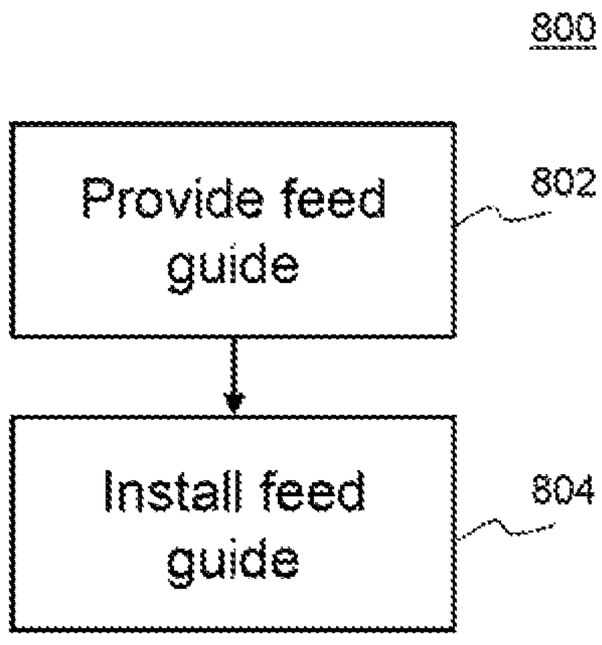

Figure 8

SHEET MEDIA PROCESSING MACHINES WITH RE-FEED PREVENTION ELEMENTS

BACKGROUND

Some scanners, multi-function printers and other types of sheet media processing machines are provided with media inlets and outlets on the same side of the machine to receive and discharge sheet media respectively. This may enable a user to conveniently feed sheet media into the machine and subsequently retrieve it after processing. In some examples, sheet media may comprise paper, cardboard, plastics or the like, which may be relatively flexible.

BRIEF DESCRIPTION OF DRAWINGS

Examples will now be described, by way of non-limiting example, with reference to the accompanying drawings, in which:

FIGS. **1** and **2** are simplified schematics of an example sheet media processing machine;

FIGS. **3** to **5** are simplified schematics of example feed guides for a sheet media processing machine;

FIGS. **6** and **7** are simplified schematics of a further example sheet media processing machine; and

FIG. **8** is a flowchart of an example of a method including installing a feed guide on a sheet media processing machine.

DETAILED DESCRIPTION

FIGS. **1** and **2** show an example sheet media processing machine **100**, such as a printer, scanner or photocopier, comprising a media inlet **102**, media outlet **104** and a feed mechanism **106** extending between the media inlet **102** and the media outlet **104**. The media inlet **102** receives sheet media along a feed direction, and a re-feed prevention element **108** comprising an elastomer is disposed upstream of the media inlet **102** with respect to the feed direction.

The media inlet **102** and the media outlet **104** are disposed on the same first side **110** of the machine, which may enable a user to load sheet media for processing by the machine, and subsequently retrieve the sheet media in a convenient manner. For example, the first side **110** of the machine may be a front side of the machine. The media inlet **102** is disposed above the media outlet **104**. Because the media inlet **102** and the media outlet **104** are located on the same first side **110** of the machine, there is an external recirculation path between the media outlet **104** and the media inlet **102** along which sheet media discharged from the media outlet **104** may curl towards the media inlet **102**. In this example the feed direction extends towards the media inlet from the first side of the machine (from left to right in FIG. **1**) and is inclined upwardly over the feed guide, for example, by an angle of up to 30° above the horizontal. In this example the discharge direction extends away from the machine towards the first side of the machine (from right to left in FIG. **1**) and is substantially horizontal at the media outlet. Accordingly, in this example, the feed direction and discharge direction have opposing lateral components. The path of a particular discharge portion of sheet media away from the media outlet may depend on whether it tends to curl, for example along a recirculation path towards the media inlet.

In previously considered media processing machines in which a media inlet and media outlet are provided on the same side of the machine, a discharged portion of sheet media may curl towards the media inlet along such an external recirculation path, and may be drawn back in towards the media inlet by contact with a feed portion of sheet media, which may be a portion of the same piece of sheet media. This may result in recirculation of the discharged media, and consequently jamming of the machine that may damage the machine and/or the media (which may be a valuable original when the machine is a scanner or copier). Such recirculation may be more likely to occur when the sheet media is prone to curling, and may occur despite the presence of guards or deflectors extending from the machine between the media outlet and media inlet, particularly when the sheet media is relatively thick. Such guards or deflectors of previously considered machines may project significantly in front of a media inlet, and may have sharp edges.

In the example sheet media processing machine **100** of FIGS. **1** and **2**, a re-feed prevention element **108** is provided upstream of the media inlet **102** with respect to the feed direction so that it is exposed to contact with sheet media. In this example, the re-feed prevention element **108** comprises an elastomer material. In this particular example, the re-feed prevention element **108** is supported on a feed guide **112** extending towards the media inlet.

In this example, the feed guide **112** is mounted to the first side **110** of the sheet media processing machine **100** so that an upper surface **116** of the feed guide terminates at the media inlet **102** to guide sheet media **114** directly into the media inlet **102**. The feed guide **112** extends laterally away from the first side **110** of the media processing machine. Further, in this particular example the feed guide **112** is inclined downwardly away from the media inlet **102**, such that its angle of inclination with respect to the horizontal in use may be similar to the angle of inclination of a feed portion of sheet media **114** overlying the feed guide **112** which drapes over the distal edge **118** of the feed guide **112**, such as between 10 and 30 degrees below the horizontal.

In this particular example, the re-feed prevention element **108** comprises an elastomer overmolding on the distal end of the feed guide **112**, and extends along the full width of the feed guide **112**, which is substantially the same width as the media inlet **102** (FIG. **2**). In this example, the feed guide **112** extends approximately 15 cm from the media inlet **102** along the feed direction so that the re-feed prevention element **108** is spaced approximately 15 cm away from the media inlet **102** along the feed direction. In other examples, the feed guide **112** may be of other sizes and the re-feed prevention element may be spaced apart from the media inlet by a different distance, such as 40 cm or less, 30 cm or less, 20 cm or less, or 10 cm or less. The spacing may be 2 cm or more, 5 cm or more, or 10 cm or more. In this example, the re-feed prevention element has an extent along the feed direction of approximately 3 cm so that it covers a tip portion of the feed guide **112** and is exposed on an external surface of the feed guide **112**. In other examples, the re-feed prevention element may be set back from a tip or distal end of a feed guide, for example, a re-feed prevention element may be disposed part way between the proximal and distal ends of a feed guide on the upper surface of the feed guide.

In other examples the re-feed prevention element **108** may not be provided on a feed guide, for example, the re-feed prevention element may be provided on a support extending from the sheet media processing machine which is not a feed guide, for example, a retractable or pivotable support extending from a recess located mid-way between the media inlet **102** and the media outlet **104**.

Further, in other examples the re-feed prevention element **108** may be formed in any suitable way so that it is exposed

to contact with sheet media. For example, the re-feed prevention element may be a discrete elastomeric element partially embedded in a feed guide or support to which it is coupled, for example, by way of protrusions that are received in recesses within the feed guide or support. Further, the re-feed prevention element may be a heat shrink tube located and formed around a support member, such as a bar, of a feed guide or support. Yet further, the re-feed prevention element may comprise an elastomeric coating on a feed guide or support to form an external surface of the feed guide or support.

The feed mechanism **106** extends from the media inlet **102** to the media outlet **104** and defines a media pathway **120** through the sheet media processing machine **100**. In this example, the feed mechanism **106** comprises a plurality of pairs of feed rollers **122**, including a pair of feed rollers **122** located adjacent the media inlet **102** and a pair of feed rollers **122** located part way along the media pathway **120**. The feed mechanism **106** has guide walls **123** to guide the sheet media **114** along the media pathway **120**, which has a C-shape through the machine **100**.

In this example, the feed mechanism **106** defines a media pathway through the machine by which the sheet media is substantially turned over, such that a side of sheet media **114** that is face-up when it is received at the media inlet **102** is face-down when it is discharged from the media outlet **104**. The feed mechanism **106** conveys the sheet media past processing units of the media processing machine, such as scanner units and/or printing units.

The sheet media processing machine **100** is suitable for receiving sheet media of different types, for example paper, cardboard, plastics or the like, which may be relatively flexible. Further, the sheet media processing machine **100** is suitable for receiving sheet media of different sizes and lengths, for example standard media sizes such as A4, A3, A2, A1 having corresponding standard lengths, and also long plots, which may have a length of 1-2 m or longer (around 40-80 inches).

In an example method of use of the sheet media processing machine **100**, a user loads long plot sheet media **114** so that an end of the sheet media **114** is fed into the media inlet **102**. The portion of sheet media **114** upstream of the media inlet is referred to as a feed portion of sheet media **114**. The feed portion of sheet media **114** extends towards the media inlet so that it drapes over the re-feed prevention element **108** owing to gravity.

The feed mechanism **106** activates the feed rollers **122** to draw the sheet media **114** through the sheet media processing machine along the media pathway **120**. A discharge portion of the long plot sheet media **114** is discharged from the media outlet **104** whilst a feed portion of the same piece of long plot sheet media **114** is still being fed towards the media inlet **102** and draped over the re-feed prevention element **108**.

In this example, the sheet media **114** curls upwards upon discharge from the media outlet **104**, for example, owing to heating along the media pathway or a pre-existing curl. Further, the sheet media **114** is sufficiently stiff that it does not fall away from the media inlet **102** when discharged. Accordingly, the end of the discharge portion of sheet media **114** is driven towards the feed portion of sheet media **114** and makes contact with the feed portion. Friction between the underside of the feed portion of sheet media **14** and the end of the discharge portion of sheet media **114** causes the end of the discharge portion to be drawn along with the feed portion towards the media inlet **102** and the re-feed prevention element **108**. This causes the side of the discharge portion which was face-down at the media outlet **104** to curl around so that it contacts the underside of the feed portion of sheet media **114**.

As the feed portion of sheet media **114** moves towards the media inlet **102** it rides (or slides) over the re-feed prevention element **108**, and draws the discharge portion of sheet media towards the re-feed prevention element **108** so that the end of the discharge portion of sheet media abuts the re-feed prevention element **108**.

Friction between the re-feed prevention element **108** and the discharge portion of sheet media **114** is greater than friction between the discharge portion and feed portion of sheet media **114**. The friction force may be influenced by the combined weight of the discharge portion and the feed portion of sheet media that may be supported on the re-feed prevention element. Accordingly, as the feed mechanism **106** continues to draw the feed portion of sheet media **114** into the media inlet **102**, the feed portion slides over the discharge portion in preference to the discharge portion sliding over the re-feed prevention element **108**. Consequently, the discharge portion of sheet media **114** is arrested at the re-feed prevention element **108**.

As the feed mechanism **106** continues to discharge sheet media **114** from the outlet, the discharge portion of sheet media **114** grows until its weight overcomes the curling effect, at which point the discharge portion falls downwardly away from the re-feed prevention element **108**.

FIG. **3** shows the example feed guide **112** for the sheet media processing machine **100** of FIGS. **1** and **2**, including the re-feed prevention element **108** provided at the distal edge of the feed guide **112**. The feed guide **112**, including the re-feed prevention element **108**, can be provided separately from the sheet media processing machine **100**, for example, so that it may be retrofitted to a sheet media processing machine **100** to inhibit recirculation of sheet media. The feed guide **112** may be secured to a sheet media processing machine **100** by any suitable means, for example, the feed guide **112** may have attachment portions to attach to corresponding attachment portions on the sheet media processing machine **100**, such as locking tabs, projections or a groove. In other examples, the feed guide **112** may be secured to the sheet media processing machine **100** by a mechanical fastener such as a bolt or screw.

FIGS. **4** and **5** show a further example feed guide **124** including a re-feed prevention element **130**. In this example, the feed guide **124** is in the form of an elongate member or feed guide body **125** which can be attached to a sheet media processing machine **100** at its proximal edge **126** (i.e. the edge adjacent the machine in use), as described above. In this particular example, the feed guide **124** is provided with countersunk through-holes **128** at either lateral ends of its proximal edge **126**, through which bolts or screws can be inserted to engage corresponding threaded holes adjacent the media inlet **102** of the sheet media processing machine.

The re-feed prevention element **130** is provided on a support **132** extendable from the feed guide body **125**. The support **132** is shown in a retracted configuration in FIG. **4** and an extended configuration in FIG. **5**. The support **132** is in the form of a U-shape bar having two parallel arms **134** that extend in a plane substantially parallel to an upper surface **136** of the feed guide. The feed guide upper surface **136** of the feed guide **124** is inclined approximately 20° below the horizontal when the feed guide **124** is attached to a media processing machine **100**. The two parallel arms **134** extend in a direction substantially normal to the distal edge of the upper surface **136**. The distal ends of the arms **134** are

connected by a lateral bar portion **138** extending between them and parallel with the distal edge of the feed guide body **125**.

In this particular example, the feed guide body **125** is hollow and may be formed of extruded aluminium or steel having a hollow cross-section. The proximal ends of the parallel arms **134** extend through port covers **140** in the distal edge **118** of the feed guide body **125**. The port covers **140** allow sliding movement of the support **132** relative the feed guide body **125** between the retracted and extended configurations along an extension direction parallel with the arms **134**. The proximal ends of the arms **134** are provided with retaining elements within the hollow cross-section of the feed guide body **125** to inhibit inadvertently separating the support **132** from the feed guide body **125**. The feed guide body **125** may be provided with internal detents to engage with corresponding formations on the support **132** (such as a groove) to locate the support **132** in the retracted and/or extended configurations. The detent or detents may be released by the application of a retracting or extending force (i.e. by pushing or pulling on the support **132**). The retracting force to release the detent(s) and retract the support from the extended configuration may be greater than the force experienced by the re-feed prevention element and support owing to a discharge portion of sheet media abutting the re-feed prevention element.

The port covers **140** fit within corresponding slots machined in the feed guide body **125**, and each may include a guide duct corresponding to the cross-section of the respective arm **134** to inhibit play (i.e. relative movement away from the extension direction) between the support **132** and the feed guide body **125**.

In this example, the U-shape bar is a metal bar, for example stainless steel, and the re-feed prevention element **130** comprises a heat shrink elastomer tube formed on the bar (i.e. before the bar is assembled into the feed guide body **125**). In this particular example, the tube is formed of silicone rubber. In other examples, the re-feed prevention element **130** may take other forms, for example it may be partially embedded in the support **132**, or may be formed as a coating on the support **132**.

As shown in FIGS. **4** and **5**, the width of the support **132** and re-feed prevention element **130** is less than the width of the feed guide **124** (and so a media inlet to which the feed guide **124** corresponds), and is disposed at a central lateral location on the feed guide **124**. The central location may prevent a discharged portion of sheet media turning or pivoting around the re-feed prevention element **130** in use.

Further, in the example shown in FIGS. **4** and **5**, the feed guide **124** has a width corresponding to the short side of an A1 sheet of media (594 mm), whereas the width of the support **132** and the re-feed prevention element **130** is approximately 190 mm wide, which is approximately 30% of the width of the sheet media. The applicant has found this width to be more than sufficient for preventing re-feed of a discharged portion of paper for sizes including A1 sheets. Re-feed prevention elements having a width of less than 30% of the corresponding feed guide **124** may be equally effective in preventing re-feed of sheet media that is the same width as the feed guide **124**. In particular, in this example, the width of 190 mm is considered to be substantially more than a minimum width to prevent re-feed, and this width is selected to prevent the side portions of sheet media to the left and right of the support **132** and re-feed prevention element **130** from sagging and causing folds or marks in the sheet media, rather than for providing sufficient friction force to prevent re-feed.

In other examples, a re-feed prevention element may be 10% or more, 20% or more, 30% or more of the width of a corresponding feed guide **124**, and may be 100% or less, 75% or less or 50% or less than the width of a corresponding feed guide **124**.

The feed guide **124** (including the support **132** and re-feed prevention element **130**) can be installed on a sheet media processing machine **100** substantially as described above with respect to FIGS. **1** and **2** (i.e. in place of the feed guide **112**). FIGS. **6** and **7** show the feed guide **124** installed on a sheet media processing machine **100**.

In an example method of use, the feed guide **124** may be attached to a sheet media processing machine **100** as shown in FIGS. **6** and **7**. If the support **132** is stowed in the retracted configuration, it may be extended to the extended configuration by pulling the support **132** or re-feed prevention element **130** for use. In this example, when attached to the sheet media processing machine **100**, the re-feed prevention element **130** can be extended from a separation of approximately 8 cm from the media inlet **102** to a separation of approximately 14 cm from the media inlet **102** with respect to the feed direction. In other examples the re-feed prevention element may be extendible over a greater or shorter distance, for example between 2 cm and 20 cm of extension relative the feed guide body **125**. Further, in other examples the feed guide **124** may be shorter or longer along the feed direction, for example between 5 cm and 40 cm.

Sheet media **114** is provided to the media inlet **102** and drawn through the feed mechanism **106** as described above with respect to FIGS. **1** and **2**. When the discharge portion of the sheet media **114** curls towards the media inlet **102** and is drawn into abutment with the re-feed prevention element **130**, the friction between the discharge portion of the sheet media **114** and the re-feed prevention element **130** is greater than the friction between the discharge portion of the sheet media **114** and the feed portion of the sheet media **114**. Accordingly, the feed portion of the sheet media **114** is drawn to slide over the discharge portion of the sheet media **114** and the discharge portion is arrested at the re-feed prevention element **130**.

FIG. **8** is a flowchart setting out an example of a method **800**. In block **802**, a feed guide comprising a re-feed prevention element is provided, the re-feed prevention element comprising an elastomer. In block **804**, the feed guide is installed on a sheet media processing machine. The sheet media processing machine comprises a media inlet **102** to receive sheet media along a feed direction from a first side of the machine, and a media outlet **104** to discharge sheet media along a discharge direction towards the first side of the machine, such that there is an external recirculation path along which discharged sheet media can curl towards the media inlet. The media inlet **102**, media outlet and feed mechanism may have any combination of the features described above with respect to the sheet media processing machine of FIGS. **1**, **2**. **6** and **7**. The feed guide is installed on the sheet media processing machine to guide sheet media along a feed direction towards the media inlet of the machine, and so that the re-feed prevention element is disposed upstream of the media inlet relative the feed direction and exposed to contact with sheet media.

The feed guide may have any combination of the features described above by reference to the feed guide **112** of FIGS. **1** to **3**, and by reference to the feed guide **124** of FIGS. **4** to **7**.

In a further example method, prior to installation of the feed guide in block **804**, the sheet media processing machine may comprise a feed guide without a re-feed prevention

element comprising an elastomer. Accordingly, the method may additionally comprise removing the pre-existing feed guide, before installing the feed guide including a re-feed prevention element comprising an elastomer.

In some examples, there may be a plurality of discrete re-feed prevention elements, for example, arranged side-by-side along a lateral axis.

Although examples have been described in which a retractable or extendable support and re-feed prevention element are extended to an extended configuration for use, the re-feed prevention element may be effective in arresting a discharge portion of sheet media and preventing recirculation in the retracted configuration and any position therebetween. Extension may help to avoid recirculation since a discharge portion of sheet media may be more prone to sagging or falling away from an inlet due to gravity.

Where a feed guide is provided, the feed guide body may be non-elastomeric, and/or may comprise a material selected so that friction between the feed guide body and sheet media is less than friction between two portions of sheet media, when the sheet media comprises paper or card. For example, the feed guide body may comprise aluminium, steel or a rigid plastics material.

While the method, apparatus and related aspects have been described with reference to certain examples, various modifications, changes, omissions, and substitutions can be made without departing from the spirit of the present disclosure. It is intended, therefore, that the method, apparatus and related aspects be limited only by the scope of the following claims and their equivalents. It should be noted that the above-mentioned examples illustrate rather than limit what is described herein, and alternative implementations may be designed without departing from the scope of the appended claims. Features described in relation to one example may be combined with features of another example. Features described in relation to one example may be combined with features of another example. In particular, a feed guide and re-feed prevention member may have any combination of the features of the feed guide and re-feed prevention members described with respect to FIGS. **1-7**.

The word "comprising" does not exclude the presence of elements other than those listed in a claim, "a" or "an" does not exclude a plurality.

The features of any dependent claim may be combined with the features of any of the independent claims or other dependent claims.

The invention claimed is:

1. A sheet media processing machine comprising:

a media inlet to receive sheet media along a feed direction from a first side of the machine;

a media outlet to discharge sheet media along a discharge direction towards the first side of the machine;

a feed mechanism to convey sheet media from the media inlet to the media outlet; and

a re-feed prevention element disposed upstream of the media inlet with respect to the feed direction and coupled to a support to inhibit recirculation of discharged sheet media along an external recirculation path between the media outlet and the media inlet, the re-feed prevention element being exposed to contact sheet media and comprising an elastomer, wherein the support is moveable between a stowed configuration and an extended configuration, wherein the spacing between the re-feed prevention element and the media inlet increases as the support is moved from the stowed configuration to the extended configuration.

2. A sheet media processing machine according to claim **1**, wherein the re-feed prevention element has a width less than a width of the media inlet.

3. A sheet media processing machine according to claim **1**, further comprising a feed guide to guide sheet media along the feed direction to the media inlet, and wherein the support is coupled to the feed guide of the machine.

4. A sheet media processing machine according to claim **3**, wherein:

the support is moveable between a stowed configuration and an extended configuration;

the support is at least partly disposed within the feed guide in the stowed configuration; and

the spacing between the re-feed prevention element and the media inlet increases as the support is moved from the stowed configuration to the extended configuration.

5. A sheet media processing machine according to claim **1**, wherein the re-feed prevention element is in the form of an elastomeric coating, overmolded layer or heat shrink tube on the support.

6. A sheet media processing machine according to claim **1**, wherein the re-feed prevention element comprises rubber.

7. A sheet media processing machine according to claim **1**, wherein the re-feed prevention element is substantially parallel with the media inlet.

8. A sheet media processing machine according to claim **1**, further comprising a feed guide to guide sheet media along the feed direction to the media inlet, and wherein the re-feed prevention element is coupled to the feed guide.

9. A sheet media processing machine according to claim **8**, wherein the re-feed prevention element is provided at the distal end of the feed guide.

10. A sheet media processing machine according to claim **1**, wherein the sheet media processing machine is a printer, scanner or photocopier.

11. A feed guide for a sheet media processing machine, the feed guide being installable to guide sheet media along a feed direction towards a media inlet of the machine and comprising:

a re-feed prevention element to inhibit recirculation of discharged sheet media in use, the re-feed prevention element being exposed to contact sheet media and comprising an elastomer, wherein the re-feed prevention element is coupled to a support being moveable between a stowed configuration and an extended configuration, wherein the spacing between the re-feed prevention and the media inlet increases as the support is moved from the stowed configuration to the extended configuration.

12. A method comprising:

providing a feed guide comprising a re-feed prevention element, the re-feed prevention element comprising an elastomer; and

installing the feed guide on a sheet media processing machine, the sheet media processing machine comprising:

a media inlet to receive sheet media along a feed direction from a first side of the machine;

a media outlet to discharge sheet media along a discharge direction towards the first side of the machine; and

a feed mechanism to convey sheet media from the media inlet to the media outlet;

wherein the feed guide is installed to guide sheet media along a feed direction towards the media inlet of the machine, and wherein the re-feed prevention element is disposed upstream of the media inlet relative the feed

direction and coupled to a support to inhibit recirculation of discharged sheet media along an external recirculation path between the media outlet and the media inlet, the re-feed prevention element being exposed to contact sheet media, wherein the support is moveable between a stowed configuration and an extended configuration, wherein the spacing between the re-feed prevention element and the media inlet increases as the support is moved from the stowed configuration to the extended configuration.

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